

REMARKS

Claims 8-13, 19, 21, and 28-35 are presented for further examination. Claims 8, 28, and 32 have been amended. Claims 15-18 have been canceled.

In the Office Action mailed August 1, 2008, the Examiner objected to the drawings and rejected claims 8-13 under 35 U.S.C. § 112, second paragraph, as indefinite, because the recitation of “epitaxial growth formed in the at least one trench to fill the at least one trench” in claim 8 was not supported in the drawings, the specification, or the original claims. Claims 8-13 were rejected under 35 U.S.C. § 103(a) as unpatentable over of Sidner et al. (previously cited) in view of Mirza et al. (previously cited). Claims 15-18, 28, 29, 32, and 33 were rejected under 35 U.S.C. § 102(b) as anticipated by Mirza et al. Claims 30, 31, 34, and 35 were rejected as obvious over Mirza et al. in view of U.S. Patent No. 4,528,047 (“Beyer et al.”). Claims 19 and 31 were rejected as obvious over Mirza et al. in view of Sidner et al.

Applicants respectfully disagree with the bases for the rejections and request reconsideration and further examination of the claims.

Drawing Objection and Section 112 Rejection

Turning first to the section 112 rejection, applicants are puzzled by the Examiner’s statement that the filling of the trench with epitaxial growth is not supported in the drawings, specification, or original claims. Applicants have found several references in the application as filed to support this feature. For example, the specification contains a clear description with respect to Figure 12, where it states: “subsequently, in Figure 12, epitaxial growth is carried out, using as a nucleus, the monocrystalline silicone of the wafer 10; consequently, monocrystalline silicone is grown horizontally, inside the trenches 15, *thus closing the latter*, and vertically, from the surface 11 . . .” (emphasis added). In addition, the description with respect to Figures 15 and 16 each conclude with “. . . and growing an epitaxial layer, to obtain the final structure of Figure 12.” Additional support is found throughout the specification. It is possible that the Examiner is confusing the “trench” with the “cavity.” With the foregoing explanation, applicants respectfully submit that the drawing objection and rejection of claims 8-13 under section 112 have been overcome.

Claim Rejections

Claim 8 has been amended to recite the cavity having walls and a closed bottom and, *inter alia*, a coating on the walls and closed bottom of the cavity with material inhibiting epitaxial growth. An epitaxial layer is also recited as formed on the substrate to cover the open top of the at least one trench and an epitaxial portion formed in the at least one trench to fill the at least trench and to encase the cavity in the substrate.

In a telephone conference with the Examiner on September 28, 2006, applicants proposed an amendment to claim 1 (which has since been canceled) in which the cavity was recited as having a wall and a bottom, and the cavity wall and bottom were coated with a layer of material inhibiting epitaxial growth. The Examiner agreed that this amendment would distinguish claim 1 from the Sidner et al. reference at column 2, lines 30-34, in which it is recited that the oxide layer is selectively removed from the bottom surface of the moat while leaving it alongside the original “side walls.”

More particularly, in Sidner et al., a cavity portion is formed in a substrate that is covered by a diaphragm portion 14 including strain gauges 18 and circuit elements 19 localized in the diaphragm portion 14. In the steps described in the formation of the cavity 16, Sidner et al. show in Figure 2B the initial formation of a moat 28 in the top surface 12a of a wafer 20 having walls on which are grown an oxide layer 30 (see column 4, lines 54-59). After the moat is enlarged to form the cavity 32, the remaining oxide 30 is removed and the cavity 32 is enclosed so that the walls have no coating whatsoever.

Applicants further note that in Sidner et al. the closing of the neck portion 34 of the cavity is done with an epitaxial growth process that uses lateral growth rather than the vertical growth so as not to fill up the cavity (see column 5, lines 33-42). Hence, there is no need for a coating on the walls of Sidner et al.’s cavity to inhibit epitaxial growth. The Examiner’s suggestion of modifying Sidner et al. with the coating of Mirza et al. to reject claims 8-13 is clearly not supported by the teachings of either of these references.

In view of the foregoing, applicants respectfully submit that claims 8-13 are clearly allowable over the combination of Sidner et al. and Mirza et al.

Claims 15-18 have been canceled.

Claims 19 and 31 were rejected as obvious over the combination of Mirza et al. and Sidner et al. With respect to Mirza et al., this reference shows a cavity 13 formed in a first silicone substrate 11 with a diaphragm formed by a second silicone substrate 17 “bonded” over the top surface 12 of the first substrate. This structure is oxidized to form a layer of silicone dioxide 19 in the cavity 13, which is done by communication through an opening 18 in the second substrate 17, thence into the port 14 and through the channel 15 into the cavity 13 (see Mirza et al., column 1, line 64 – column 2, line 30).

Clearly, Mirza et al. is not compatible with either Sidner et al. or the present claimed embodiments. Mirza et al.’s formation of silicone dioxide is to close the opening 18 and the channel 15, and the resultant lining of the cavity with the layer 19 is not for the purpose of inhibiting epitaxial growth. More particularly, Mirza et al. makes it clear that the purpose regarding the formation of silicone dioxide is to create a vacuum in the cavity in order to obtain a reference pressure sensor (see paragraph bridging columns 3 and 4). Therefore, the oxide lining is an oxygen-consumption layer, which is clearly different and incompatible with the present claimed embodiments that require an epitaxial growth inhibiting layer.

In view of the foregoing, applicants respectfully submit that claims 19 and 31 are clearly allowable over the combination of Mirza et al. and Sidner et al.

Claims 28, 29, 32, and 33 were rejected as anticipated by Mirza et al. As discussed above, Mirza et al. is incompatible with the formation of a layer of material inhibiting epitaxial growth to cover the walls and a closed bottom of the cavity as recited in claim 28. In addition, Mirza et al. does not teach or suggest trench and cavity pairs wherein the trench is filled monocrystalline material and each cavity is completely surrounded by the monocrystalline material and having walls and a closed bottom covered with a single coating formed material inhibiting epitaxial growth. In view of the foregoing discussions, applicants respectfully submit that claims 28, 29, 32, and 33 are clearly allowable and not anticipated by Mirza et al.

Claims 30, 31, 34, and 35 were rejected as obvious over Mirza et al. in view of Beyer et al. Applicants adopt the arguments above with respect to Mirza et al. in their entirety. In addition, the inventors have reviewed the Beyer et al. reference and note that the goal of Beyer et al. is form a void-free isolation structure, which is inapposite to the present claimed

embodiments, where the cavity is essential. In Beyer et al. there is no void region below the trench, but rather a P+ region, which is clearly different from the claimed embodiments. Moreover, modifying the structure of Mirza et al. to be amenable to forming nitride or TEOS is not taught, suggested, or recognized by Mirza et al. or Beyer et al. as a benefit to the structure of Mirza et al. In other words, neither reference recognizes the need for such an epitaxial growth inhibiting layer. Accordingly, applicants respectfully submit that claims 30, 31, 34, and 35 are not obvious over the combination of Mirza et al. and Beyer et al.

With respect to claims 19 and 31, the combination of Mirza et al. and Sidner et al. further does not suggest the claimed embodiments because modifying Mirza et al.'s membrane 17 to be within the thickness range of Sidner et al.'s membrane portion 14 is clearly not supported in the Mirza et al. reference. More particularly, Mirza et al. describe at column 3, lines 18-34, various thicknesses of the substrate 17, ending with the statement that the preferred thickness is approximately 10 microns. The specification of the present application describes a reduced thickness of 1-3 microns.

In view of the foregoing, applicants respectfully submit that all of the claims remaining in this application are clearly in condition for allowance. In the event the Examiner disagrees or finds minor informalities that can be resolved by telephone conference, the Examiner is urged to contact applicants' undersigned attorney by telephone at (206) 622-4900 in order to expeditiously resolve prosecution of this application. Consequently, early and favorable action allowing these claims and passing this case to issuance is respectfully solicited.

The Director is authorized to charge any additional fees due by way of this Amendment, or credit any overpayment, to our Deposit Account No. 19-1090.

Respectfully submitted,

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